

Swansea University - WICN

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Wales Institute of Cognitive Neuroscience

The Wales Institute of Cognitive Neuroscience (WICN) is a research collaboration between cognitive neuroscientists at Swansea, Cardiff and Bangor universities.



The Welsh Assembly Government has invested over £5 million to establish the new multi-centre Wales Institute of Cognitive Neuroscience (WICN). The institute presents an exciting opportunity for collaboration between cognitive neuroscientists at Swansea, Cardiff and Bangor. WICN draws together the three psychology faculties, with investment in a shared management structure, administrative support, and additional academic appointments, as well as equipment and technical support in order to grow as one institute, a world leader in the study and application of cognitive and clinical neuroscience.

Research

Here are some examples of WICN funded research being carried out at Swansea (SU) in collaboration with researchers at Cardiff University (CU), Bangor University (BU) as well as other national and international institutions (In alphabetical order of 1st collaborator). Click on the project title to read more about the research.

Project title	Collaborators
Auditory-evoked EEG oscillations associated with prepulse elicited motor responses and prepulse inhibition (PPI) of auditory startle reflex	Adrian Burgess (SU) Louise Venables (SU) Philip Corr (SU) Ewa Truchanowicz (SU)
Heavy and light drinkers' brain reactions to alcohol, emotional, and concern-related stimuli	W Miles Cox (BU) Javad Fardardi (FUM; BU) David Linden (BU) Emmanuel Pothos (SU)
Neural correlates of relational reasoning (abstract 4)	Simon Dymond (SU) Elanor Hinton (CU) Ulrich von Hecker (CU)
Neural correlates of relational reasoning: A behavioural study (abstract 4)	Simon Dymond (SU) Elanor Hinton (CU) Ulrich von Hecker (CU)
Neural correlates of problem gambling: a combined MEG and fMRI investigation (abstract 5)	Simon Dymond (SU) Natalia Lawrence (CU) Elanor Hinton (CU) W Miles Cox (BU) Keneth Yuen (BU) Niklas Ihssen (BU) Mark Dixon (Southern Illinois University)
ERP correlates of emotion-based learning (abstract 3)	Simon Dymond (SU) Oliver Turnbull (BU)
Spatial processing and memory in individuals at risk of developing Alzheimer's disease	Kim Graham (CU) Carina Hibbs (CU)

	<p>Julie Williams (CU)</p> <p>Paul Hollingworth (CU)</p> <p>Alice Varnava (SU)</p> <p>Toby Lloyd Jones (SU)</p>
An EEG exploration of the right visual field advantage in bilingual and monolingual speakers of languages with different orthographic depth (Abstract 11)	<p>Cristina Izura (SU)</p> <p>Victoria Wright (SU)</p> <p>Nathalie Fouquet (SU)</p> <p>Debbie Mills (BU)</p>
Neuroimaging risk markers of depression in young adults: a preliminary study	<p>Paul Keedwell (CU)</p> <p>Simon Dymond (SU)</p> <p>Natalia Lawrence (CU)</p> <p>Andrew Lawrence (CU)</p> <p>M Phillips</p>
Neural basis of the hypersensitivity to emotions in bipolar disorder	<p>Natalia Lawrence (CU)</p> <p>Simon Dymond (SU)</p> <p>Phillip Corr (SU)</p> <p>X Caseras (CU)</p> <p>M Phillips</p>
Similarity-based asymmetries in priming: faces and objects	<p>Toby Lloyd-Jones (SU)</p> <p>Stephan Boehm (BU)</p> <p>Ulrike Hahn (CU)</p> <p>Nathalie Fouquet (SU)</p> <p>M Roberts (BU)</p>
An ERP investigation into the role of colour in object memory	<p>Toby Lloyd-Jones (SU)</p> <p>Nathalie Fouquet (SU)</p> <p>Adrian Burgess (SU)</p>
An fMRI investigation of 3D shape representation in human lateral occipital complex using multi-voxel pattern analyses	<p>Toby Lloyd-Jones (SU)</p> <p>Charles Leek (BU)</p> <p>Stephen Johnston (BU)</p> <p>Irene Reppa (SU)</p> <p>Kenneth Yeun (BU)</p> <p>Gavin Perry (SU)</p>
The role of colour in object identification and memory: An fMRI study	<p>Toby Lloyd-Jones (SU)</p> <p>Charles Leek (BU)</p> <p>Alison Wigggett (BU)</p> <p>Stephen Johnston (BU)</p> <p>Irene Reppa (SU)</p>
An EEG and MEG investigation into the role of colour and context in object identification and memory	<p>Toby Lloyd-Jones (SU)</p> <p>Krish Singh (CU)</p> <p>Andrea Greve (CU)</p> <p>Nathalie Fouquet (SU)</p>
An ERP investigation into the use of facial movement and facial form in determining face identity	<p>Toby Lloyd-Jones (SU)</p> <p>Ian Thornton (SU)</p> <p>Nathalie Fouquet (SU)</p> <p>Adrian Burgess (SU)</p>

Semantic network growth: neural measures of the contribution of reinforcement (abstract 1)	Louise McHugh (SU) Robert Whelan (University College Dublin) Ting Wang (SU)
An exploration of MEG adaptation to faces and objects (abstract 6)	Gavin Perry (SU) Krish Singh (CU)
The time course of decision making: an MEG study (abstract 7)	Emmanuel Pothos (SU) Krish Singh (CU) Gavin Perry (SU)
Action for perception: effects of informational affordances on object perception (abstract 10)	Irene Reppa (SU) Rob Ward (BU)
Development and comparison of measures of food-related attentional bias (abstract 2)	Katy Tapper (SU) Andrew Lawrence (CU) Emmanuel Pothos (SU)
Imaging neural responses to pain-related stimuli in chronic pain patients (abstract 9)	Ann Taylor (CU) Alice Varnava (SU) Richard Wise (CU) Owen Hughes (Powys NHS Trust) Rhiannon Buck (University of Bath)
The predictive nature of pseudoneglect for simulated visual neglect following unilateral parietal disruption	Alice Varnava (SU) Chris Chambers (CU)
The neural basis of left attentional bias on line bisection judgments as assessed by fMRI and DT-MRI (abstract 8)	Alice Varnava (SU) Richard Wise (CU) Derek Jones (CU)
Delineating MEG correlates of episodic retrieval processes	Ed Wilding (CU) Toby Lloyd-Jones (SU) Nathalie Fouquet (SU)

Presentations

- Dave Playfoot, Jeremy Tree and Cris Izura presented a poster at the 2009 WICN annual conference in Deganwy, North Wales, titled 'Acronym reading in semantic dementia'. Abstract: Semantic dementia patients often present with reading deficits, commonly surface dyslexia. In this disorder, irregular words such as broad or steak are less likely to be read aloud correctly than regularly-spelled words like breed or steam (Coltheart, Masterson, Byng, Prior & Riddoch, 1983). In a series of recent studies, Laszlo and Federmeier (2007a; 2007b; 2008) used acronyms as an ideal set of familiar yet irregular stimuli to explore the reading routes of skilled readers. Here, we report the performance of 'JD', a patient in the early stages of semantic dementia, in reading aloud and recognising acronyms and words. Results are discussed in terms of the patient's deficit and the dual route model for reading.
- Victoria Wright (SU), Chris Izura (SU), Nathalie Fouquet (SU) and Debbie Mills (BU) presented a poster at the 2009 WICN annual conference, titled 'Hemispheric processing of words by bilingual speakers: Differences and similarities across hemispheres and languages'. Abstract: The ability of skilled readers to recognise printed words varies as a function of the position of the word within the visual field. Short and long words are identified at equal speed when presented to the right visual field (RVF) but a length effect is observed when words appear to the left visual field (LVF), with short words being recognised faster than long words. This effect, generally called 'right visual field advantage' (RVFA), has been reported and replicated a significant number of times. The RVFA is often attributed to the language dominance that is credited to the left hemisphere. In this study, 40 Welsh-English bilingual speakers recognized short and long words presented laterally in their two languages. Results showed a RVFA when bilingual speakers were recognising words in the dominant and irregular language (English) but not when they were recognising words in the non-dominant and regular language (Welsh). This outcome can be interpreted in relation to the participant's reading expertise but also in terms of the regularity of the languages. A further experiment has been programmed to look at the RVFA in bilingual speakers whose dominant language is this time regular and non-dominant language, irregular. Their EEG and behavioral responses will be recorded. It is predicted that if the RVFA is related to the regularity of the language, differences will be detected, as before, in English but no Spanish. However, if the effect is due to language dominance, differences will be observed in Spanish but not in English. Based on the consensus that the RVFA emerges from the early stages of word processing, we anticipate to see a main ERP difference in the early peak (N170), and will extend our analysis to the P300.
- Ting Wang, Louise McHugh and Robert Whelan presented their results from their project 'Semantic network growth: neural measures of the contribution of reinforcement' at the Second Annual Conference of the WICN at Swansea University in September 2008, and at the Annual Conference of the European Association of Behavioural Analysis in 2008.
- Simon Dymond gave a talk at the Second Annual Conference of the WICN at Swansea University in September 2008: 'Neural correlates of relational reasoning'.
- Alice Varnava presented a poster at the Experimental Psychological Society in July 2008 on her work in collaboration with Richard Wise (CU) and Derek Jones (CU): 'The neural basis of left attentional bias on line bisection judgments as assessed by fMRI and DT-MRI'.

News

- WICN held their 2009 annual conference in the beautiful setting of Deganwy, North Wales between 8th and 10th July. It was a great success with two and a half days of presentations and discussions of cutting-edge neuroscience research. You can see some examples of the posters presented in the 'Presentations' section of this webpage.

- A grant has been awarded to Judith Hall (CU), Ann Taylor (CU), Owen Hughes (Powys NHS Trust), Richard Wise (CU), Rhiannon Buck (University of Bath) and Alice Varnava (SU) by the National Institute of Academic Anaesthesia to work on a two-year project, 'Imaging neural responses to pain related stimuli in patients with chronic non-malignant pain (CNMP): pre and post a pain management programme' (£58,557), which is a continuation of their WICN research on chronic pain.
- Anita Munnelly is set to commence her PhD in 2009, supervised by Simon Dymond, on relational reasoning as a direct result of running a WICN behavioural study for her MSc.
- Ewa Truchanowicz was awarded a scholarship to attend the PENS WICN Summer School in September 2008: The Neuroscience of Memory: Methods and Concepts to Investigate Our Internal Representation of the World.

Abstracts

1. The current study involved training 40 participants using a match-to-sample procedure to relate two- four member equivalence classes, while level of reinforcement and trial presentation was manipulated (i.e., high vs. low reinforcement; high vs. low trial presentation). Subsequently, the participants were exposed to a lexical decision task involving pairs of novel stimuli and pairs of stimuli from the trained equivalence classes. Event related potentials and response time on the lexical decision task were recorded. The findings indicated that an evoked potential waveform typically associated with semantic priming (N400) was shown to be more sensitive in the low reinforcement low trial presentation condition, rather than high reinforcement high trial presentation condition. Additionally, faster response times emerged when related equivalence class pairs were presented.
2. Addiction research shows that when a person abuses a substance they display an attentional bias (AB) for information in their environment relating to this substance. That is, they direct their attention towards such information and process it more extensively. AB is important since research suggests it contributes to the maintenance and/or escalation of the addictive behaviour. This project will develop measures of food-related AB designed to distinguish between different attentional processes (e.g., initial attention toward the information versus sustained attention). It will also assess the sensitivity of these measures to a range of predictors (e.g., hunger, dieting, sensitivity to reward).
3. The Iowa Gambling Task (IGT) is a widely employed measure of emotion-based learning which involves participants making choices from four decks of cards. Two of the decks (A & B) result in immediate high reward per choice, but a cumulative net loss (called the "disadvantageous" choice). The remaining two decks (C & D) result in a lower immediate reward and lower net loss resulting in a cumulative long-term gain (called the "advantageous" choice). The present proposal will investigate, for the first time, the event related potential (ERP) correlates of IGT performance during and after the critical decision-making periods.
4. The aim of this project was to employ fMRI to investigate the neural correlates of human relational reasoning. Using a unique transitive inference paradigm, we planned to study how and if brain activation varied during the task according to different training schedules (learning All-more or All-less relations) and between different components of the TI task, in regions such as the hippocampus, parietal and prefrontal cortex. (The TI task involved learning a novel hierarchy of relations between arbitrary stimuli: A<B<C<D<E).
5. Many people enjoy gambling without long-term harm, but a minority go on to experience significant personal and financial difficulties. Identifying the neural markers of vulnerability to problem and pathological gambling is not only important for informing treatment approaches but also in order to prevent gambling from being a source of crime or disorder. Little is known about the brain regions activated during gambling and how they might differ between problem gamblers and non-gamblers. Therefore, the present proposal will employ functional brain imaging to determine the time-course (with MEG) and magnitude (with fMRI) of brain activation patterns in problem gamblers and matched healthy non-gamblers.
6. 'Neural adaptation' (also known as 'repetition suppression') effects have been used in fMRI studies to probe the selectivity of areas of visual cortex for particular stimuli. However, due to the poor temporal resolution of fMRI, little is known about the timing or frequency components of these stimulus selective responses. Hence, we propose to explore these effects in MEG, a technique with temporal resolution on the millisecond scale, by measuring adaptation across both between-category and within-category face and object stimuli.
7. We would like to put under the microscope the process of reaching a particular decision. What happens when we feel we are ambivalent between two choices? One possibility is that there is a 'good' choice and a 'bad' choice, and the brain simply needs a little bit of time to identify the good choice from the bad one; once it has done so, we have the feeling that 'we made up our minds'. Another possibility is that the brain is less able to discriminate between good and bad choices and has to alternate between the two for a while, until one emerges as better than the other. Our proposed research addresses this issue and so hopes to shed light onto one of the most important aspects of cognitive function.
8. Most healthy individuals demonstrate a leftward visuospatial attentional bias when making judgments of linear extent: a phenomenon termed 'pseudoneglect'. Little is known about the pre-existing (normal) neural circuitry specifically associated with pseudoneglect. The aim of this study was to determine which cortical regions and connecting sub-cortical pathways are associated with this phenomenon, as assessed by functional magnetic resonance imaging (fMRI) and diffusion tensor magnetic resonance imaging (DT-MRI).
9. Neuroimaging has allowed for an improved understanding of how variables such as cognition, emotion and context can influence the perception of chronic non-malignant pain (CNMP). However, the majority of neuroimaging work has focused on acute experimentally-induced pain. This can be very different from CNMP in its characteristics and threat value. If pain is interpreted catastrophically, this can result in a vicious cycle of fear, hyper-vigilance and avoidance of activities. This in turn can result in disuse, disability, depression and lower pain threshold, thereby perpetuating the problem. Therefore, obtaining reliable objective information related to the individual's subjective pain experience provides a powerful means of understanding CNMP. The aim is to investigate neural activity in affective and attentional regions in CNMP patients vs. healthy controls, as assessed by fMRI.
10. BACKGROUND: Previous work has shown that object perception can automatically influence action. In particular, object affordances, like the handle of a cup, automatically activate a range of responses that are compatible with that affordance (e.g. Phillips & Ward, 2002). Affordance effects of this kind can be described as examples of perception for action. Here we propose a pilot study looking at the related but novel concept of action for perception. When analysing a complex 3D object, we are not simply passive receivers of a 2D image. We can manipulate the object, ourselves, or both, in order to gain new viewpoints of the object to aid in its recognition. We propose to look at whether there is automatic activation of actions that would bring into view what we call informational affordances: the parts of an object that provide discriminative information about object identity or function. METHOD: We train participants to use the keys on the keyboard in order to rotate a cube appearing on the screen. The task was to take the shortest path to the discriminatory face of the cube and then to decide whether the shape on the discriminatory face was a star or a triangle. In the test phase targets appeared on a face of the cube denoting left or right. Target responses were therefore compatible or incompatible with the previously learnt response to rotate the cube. RESULTS: Overall the data showed that the action (key-press) associated with revealing information about the object was activated during perception of the object, interfering with the target localisation task. This was the case the fact that the object was irrelevant to the task in hand. CONCLUSIONS: Our findings have implications in theorising about the link of perception and action. In particular, the finding that informational affordances elicit informational affordances would imply that areas like motor, pre-motor, and supplementary motor areas are involved in visual object recognition, as well as executive systems for regulating automatic response activation.
11. The time it takes to recognise a word is modulated, amongst other things, by its location in the visual field and the number of letters included in the word. Long words presented in the left visual field, take longer to recognise than short words. However, when the same long words are presented in the right visual field the recognition time is equal to that of short words. This striking phenomenon is the so called right visual field advantage (RVFA; see Ellis, 2004 for a review). The aim of this proposal is to study the pattern of neural activity related to the RVFA when bilingual and monolingual speakers attempt to recognise words in the languages they know.

